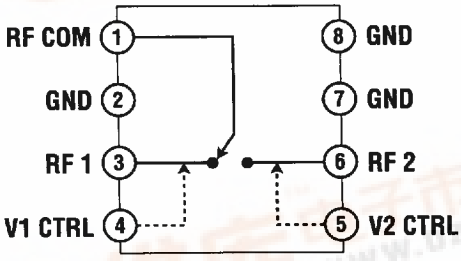


TQ9155

DC-2.5 GHz RF SPDT Switch

Features

- Industry-Standard Pinout
- Low Cost
- Small SOIC8 Package
- Wide Frequency Range
- Fast Switching Speed

Applications

- General-Purpose RF
- Cellular
- PCS
- GPS
- Fiber Optic Modules

The TQ9155 is an industry-standard, Single-Pole, Double-Throw (SPDT) RF switch designed for use in the DC - 2.5 GHz frequency range. The switch is intended for use in general-purpose RF applications such as T/R switching, switch matrices, and antenna diversity. It operates from a 0/-4 V or a single +4 V control voltage. The switch's low cost, industry-standard pinout, small-sized SOIC8 package, and ease of design make it extremely useful in portable wireless systems.

Electrical Specifications (1)

Test Conditions: V_{HIGH} = 0 V, V_{LOW} = -4 V, TA = 25° C, P_{IN} = 0 dBm, Freq = 2.0 GHz

Parameter	Min	Typ	Max	Units
Insertion Loss		0.6	1.0	dB
Isolation	22	23		dB
Return Loss		17	14	dB

Note: 1. All min/max values are 100% RF tested.

Operating Range

Parameter	Conditions	Min	Typ	Max	Units
Frequency		DC		2.5	GHz
Control Voltage [1] V_{LOW}		-8.0		-4.0	V
Control Voltage [1] V_{HIGH}		-0.5		+0.2	V
Temperature		-40		+85	°C

Note: 1. Control Voltage is referenced to the DC voltage on Pin 1 (RF COM).

Electrical Specifications

Test Conditions: V_{HIGH} = 0 V, V_{LOW} = -4 V, T_A = 25° C, P_{IN} = 0 dBm, Freq = 2.0 GHz

Parameter	Conditions	Min	Typ	Max	Units
Insertion Loss:	100 MHz		0.4		dB
	500 MHz		0.4		dB
	1000 MHz		0.5		dB
	2000 MHz		0.6	1.0	dB
	2500 MHz		0.7		dB
Isolation:	100 MHz		55		dB
	500 MHz		42		dB
	1000 MHz		33		dB
	2000 MHz	22	23		dB
	2500 MHz		20		dB
Return Loss:	100 MHz		>25		dB
	500 MHz		>25		dB
	1000 MHz		18		dB
	2000 MHz		17	14	dB
	2500 MHz		17		dB
Input 1dB Compression Pt	500 - 2500 MHz		28		dBm
Control Current	V_{LOW} = -4.0 V		<30		µA
	V_{LOW} = -8.0 V		<300		µA
Rise/Fall Time (10% - 90%)			2		ns

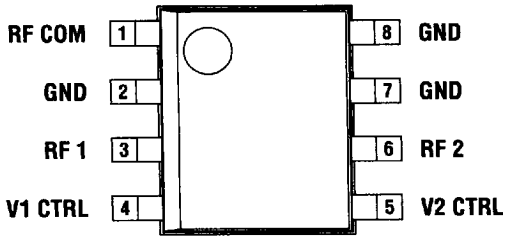
Truth Table

Control Inputs		Condition of Switch RF Common to RF Port	
V1 CTRL	V2 CTRL	RF1	RF2
V_{HIGH}	V_{LOW}	Isolation	Low Loss
V_{LOW}	V_{HIGH}	Low Loss	Isolation

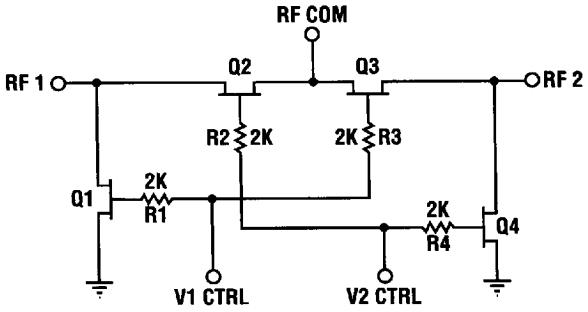
Pin Descriptions

Pin Name	Pin #	Description
RF COM	1	Common RF input. DC blocking required if external DC is present.
RF 1	3	RF Input 1. DC blocking required if external DC is present.
RF 2	6	RF Input 2. DC blocking required if external DC is present.
V1 CTRL	4	V1 Control Input.
V2 CTRL	5	V2 Control Input.
GND	2,7,8	Ground Connections.

TQ9155 Pinout

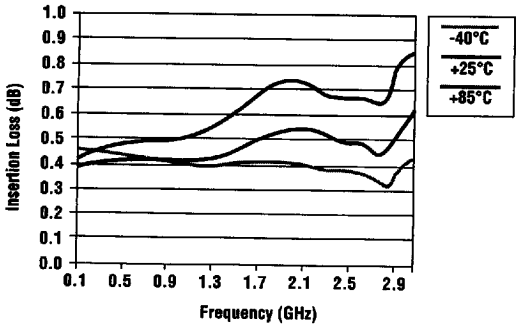


Simplified Schematic

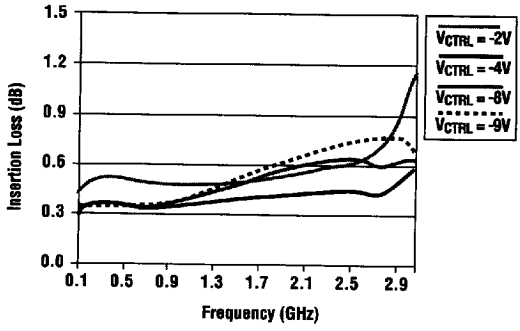


Typical Performance

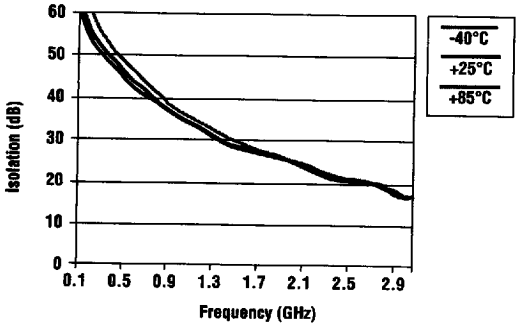
Insertion Loss vs. Frequency vs. Temperature



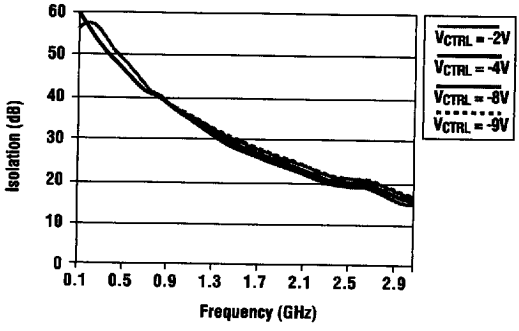
Insertion Loss vs. Frequency vs. V_{CTRL}



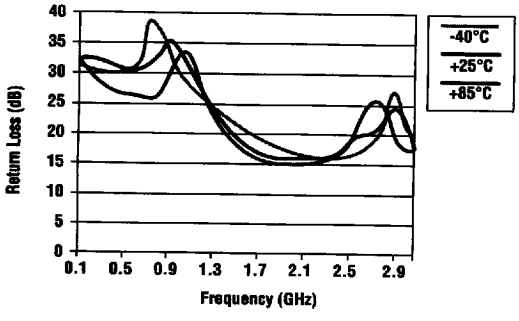
Isolation vs. Frequency vs. Temperature



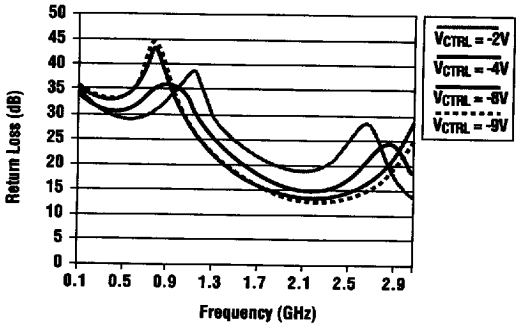
Isolation vs. Frequency vs. V_{CTRL}



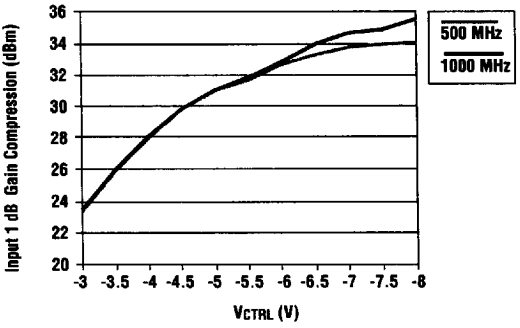
Return Loss vs. Frequency vs. Temperature



Return Loss vs. Frequency vs. V_{CTRL}



1dB Gain Compression vs. V_{CTRL} vs. Frequency



General Description

The TQ9155 is an industry-standard, Single-Pole, Double-Throw (SPDT) reflective RF switch designed for use over the DC to 2.5 GHz frequency range. The device consists of four depletion-mode transistors configured in a classic series/shunt arrangement as shown in the simplified schematic. The selection/switching of the RF signal path is accomplished via control voltages applied to the V1 CTRL and V2 CTRL pins. The selected RF port provides a low-loss signal path to the RF common port, while the other RF port exhibits a high-isolation connection to the RF common port.

The TQ9155 is useful for a wide range of RF switching applications. These include transmit/receive and antenna diversity switching in Cellular (824-849 MHz), GPS (1575 MHz), DECT (1880-1900 MHz), PHS (1895-1907 MHz), and PCS (1850-1990 MHz) systems, 2.4 GHz ISM-band data communications and general-purpose RF.

Performance is guaranteed at 2.0 GHz, and parts are 100% RF tested at that frequency. Use at lower frequencies results in improved insertion loss, isolation, and return loss. The part is packaged in a small, low-cost SOIC8 plastic package with an industry-standard pinout.

Control Voltages

Switching control is achieved via control voltages applied to the V1 CTRL and V2 CTRL pins. Control voltage is referenced to the bias voltage on the RF COM port, and ranges from -8 V to -4 V for V_{LOW} and from -0.5 V to +0.2 V for V_{HIGH}.

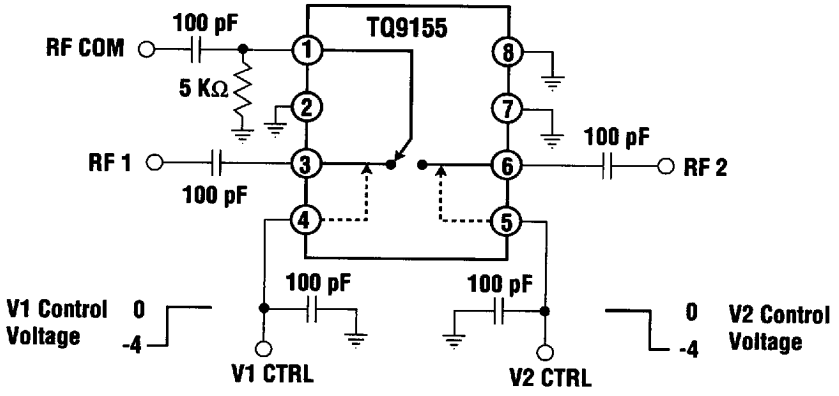
In order to achieve proper switch selection, V1 CTRL and V2 CTRL voltages must be of opposite sense. An external circuit is needed to drive the two control voltage pins.

Specifically, to select RF1, apply a V_{HIGH} control voltage to V2 CTRL and a V_{LOW} control voltage to V1 CTRL. To select RF2, apply a V_{HIGH} control voltage to V1 CTRL and a V_{LOW} control voltage to V2 CTRL.

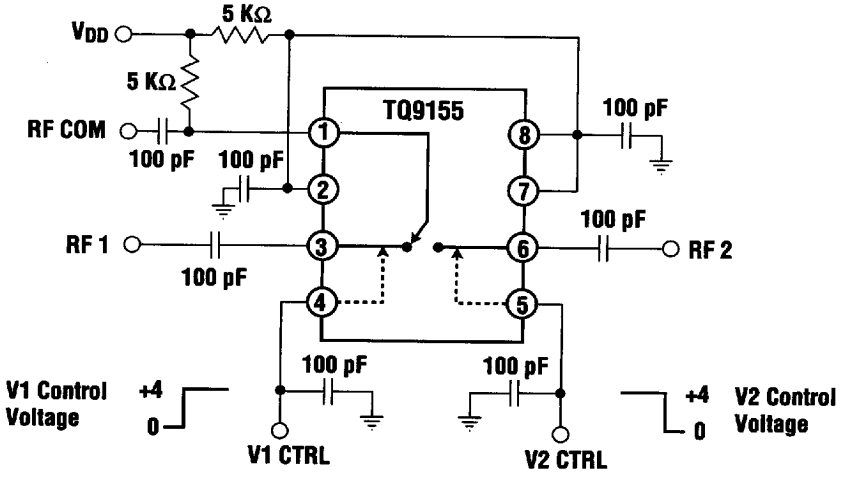
Application Circuit

The TQ9155 is very straightforward to apply. DC blocking capacitors are needed on RF COM, RF1 and RF2 if any external DC is present. The device nominally operates with 0 V/-4 V on/off control voltages. For those applications where a negative voltage supply is not readily available, however, the TQ9155 can be operated with a positive (+4 V) control voltage by modifying the external circuit. This can be accomplished by raising the bias voltage on RF COM (Pin 1) to +4 V through two external 5 KΩ resistors connected to RF COM (Pin 1) and the ground pins (Pins 2, 7, 8). In addition, RF bypass capacitors are added to Pins 2, 7, 8. Suggested application circuits for both negative and positive control voltage implementations are included.

Application Circuit - Negative Control Voltage



Application Circuit - Positive Control Voltage (Single Supply)



Absolute Maximum Ratings

Parameter	Min.	Typ.	Max.	Units
Input RF Power < 0.5 GHz			27	dBm
0.5 - 2.0 GHz			34	dBm
Control Voltage [1]	-9		+4	V
Operating Temperature	-40		+85	° C
Storage Temperature	-65		+150	° C

Note: 1. Control Voltage is referenced to the DC voltage on Pin 1 (RF COM).

SO-8 Plastic Package (N-Suffix)